

CLAIMS

We claim:

1. A common mode noise reducing apparatus for reduction of common mode noise in a switching power converter, the common mode noise reducing apparatus comprising:

means for sensing a signal potential difference that is at least in part due to the common mode noise;

a voltage generating source producing a counter-acting voltage that reduces the signal potential difference; and

a series impedance coupled to the voltage generating source such that the series impedance is also in a path through which the common mode noise can flow, whereby the series impedance effectively produces a short circuit for the common mode noise with the aid of the counter-acting voltage.

2. The common mode noise reducing apparatus of claim 1 wherein the voltage generating source is a counter-acting winding coupled to a primary winding and a secondary winding in a transformer in the switching power converter.

3. The common mode noise reducing apparatus of claim 1 wherein the voltage generating source includes an amplifying device having at least one input connection receiving the signal potential difference and at least one output connection coupled to the path effectively short circuiting the common mode noise.

4. The common mode noise reducing apparatus of claim 1 wherein means for sensing the signal potential difference include an impedance connected in series in the path through which the common mode noise can flow, which path includes nodes on both the input and the output sides of the switching power converter.

5. The common mode noise reducing apparatus of claim 1, wherein means for sensing the signal potential difference include a counter-acting winding magnetically coupled to the primary winding and the secondary winding.

6. The common mode noise reducing apparatus of claim 5, wherein further the counter-acting winding is wound with the primary and the secondary winding of the transformer in the switching power converter such that the secondary winding is between the primary winding and the counter-acting winding.

7. The apparatus of claim 6, wherein the primary winding and the counter-acting winding have substantially the same number of turns.

8. The apparatus of claim 6, wherein the secondary winding is placed between the primary and the counter-acting windings such that the sum of switching noise generated by the primary and the counter-acting windings is substantially reduced in the secondary winding.

9. A switching power converter with reduced common mode noise, the switching power converter comprising:

a transformer with a primary winding and a secondary winding;

at least one terminal on an input side;

at least one terminal on an output side; and

at least one counter-acting winding coupled to the primary winding and the secondary winding, the at least one counter-acting winding providing a counter-acting voltage to reduce a signal potential difference corresponding to the common mode noise.

10. The apparatus of claim 9 wherein the counter-acting winding is wound on a bobbin with the primary and the secondary winding of the transformer in the switching power converter such that the secondary winding is between the primary winding and the counter-acting winding.

11. The apparatus of claim 10, wherein the primary winding and the counter-acting winding have substantially the same number of turns.

12. The apparatus of claim 10, wherein the secondary winding is placed between the primary and the counter-acting windings such that the sum of switching noise generated by the primary and the counter-acting windings is substantially reduced in the secondary winding.

13. The switching power converter of claim 9 further comprising a capacitor coupled in series in a path that includes, the at least one counter-acting winding, the at least one terminal on the input side and the at least one terminal on the output side, whereby reducing the common mode noise.

14. The switching power converter of claim 13 wherein the capacitor is coupled to one or more of a first node separated from an output terminal by a low impedance and a second node separated from an input terminal by a low impedance.

15. The switching power converter of claim 9 further including an electromagnetic noise-filtering element.

16. The method for converting power of claim 10 further comprising coupling an electromagnetic noise-filtering element to the counter-acting winding.

17. A method for reduction of common mode noise comprising:

providing a switching power converter having an input side terminal and an output side terminal;

providing means for sensing a signal potential difference corresponding to a common mode noise;

providing an amplifying device having at least one input connection that receives the signal potential difference, and at least one output connection that provides a counter-acting voltage in response to the signal potential difference; and

providing means for coupling the at least one output connection of the amplifying device to a path connecting the input terminal to the output terminal whereby the counter-acting voltage produced by the amplifying device reduces the potential difference between the input side terminal and the output side terminal.

18. The method of claim 17 wherein the means for sensing a signal potential difference includes a counter-acting winding that produces a counter-acting voltage, wherein further the counter-acting winding is wound on a bobbin with a primary and a secondary winding of a transformer in the switching power converter such that the secondary winding is between the primary winding and the counter-acting winding.

19. The method of claim 18, wherein the primary winding and the counter-acting winding have substantially the same number of turns.

20. The method of claim 18, wherein the secondary winding is placed between the primary and the counter-acting windings such that the sum of switching noise generated by the primary and the counter-acting windings is substantially reduced in the secondary winding.